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Designing the
computers of the '80s

New processes for
producing polypropylene

Ceramic linings
for long-lived pipes

Use of electrical
and electronic instruments

Heater design for
diffusion pumps

1980 Vacuum Show preview

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Identify crisis

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SPECIAL SECTIONS

- C1 **Chromatography:** 32,000 copies
contain this section following p. 178.
approx. 3,000 copies
to nonqualified readers
contain pp. 2A and 2B.

ABOUT THE COVER

On exposure to high temperatures, silicone elastomers generate relatively little smoke. They have relatively low fuel values, and they resist combustion.

Since the silicones burn slowly, they deplete oxygen in a confined space at a lower rate than do many other organic materials. And burning silicone is essentially free from burning drip.

To achieve flame resistance, Dow Corning relies on the inorganic backbone, rather than on phosphorus- or halogen-containing constituents—ingredients that can render the smoke highly toxic.

This impressionistic photo was created by Lloyd Wright of Bradford-LaRiviere, Saginaw, Mi., for Dow Corning.

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INDUSTRIAL RESEARCH & DEVELOPMENT

SERVING THE \$127-BILLION WORLD-WIDE R&D INDUSTRY

NEWS OF SCIENCE AND TECHNOLOGY

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- 143 **Total organic carbon analyzer:** S.C. Creason and T.J. Kehoe, Beckman Instruments Inc.; new instrument speeds analyses for contaminants in plant effluents and process streams.
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Digital grows in use of electrical and electronic instruments

The latest IR&D Trends survey, with nine new instrument categories, confirms the growing importance of digital techniques and instruments in all sectors of R&D

MICROPROCESSORS, holding their first place in planned acquisition within the next year and the same ranking of seventh in present use, lost top position in the growth rate sweepstakes in the 1980 IR&D Trends survey of electrical and electronic instrumentation. Four newly added instrument categories—microprocessor development systems, logic analyzers, IEEE 488 bus, and data loggers—all rank higher in growth rate, which relates plans of Trends survey respondents to acquire a particular instrument type to the present use of that type.

Significantly, all four are digital instruments and systems. And sixth place in growth rate was garnered by digital storage oscilloscopes, which is also a newly added category.

The four other new categories are waveform analyzers, time and frequency counters, portable oscilloscopes, and analog storage oscilloscopes. To make room for the additions, nine categories studied in the 1979 Trends survey were dropped: network analyzers, wide-band amplifiers, elapsed time indicators, differential amplifiers, electrometers, dc amplifiers, delayed-sweep oscilloscopes, ac amplifiers, and picoammeters. A question covering the sector in which a respondent was employed was also added to the questionnaire.

Results of the Trends survey are presented graphically on these pages.

Present use and plans to acquire are graphed as per cent of the total number of respondents on the facing page. Growth rates are summarized in the chart on page 127, which gives the total growth rate and the growth rate for new users—those who indicated that they do not presently use a particular instrument but who indicated that they plan to acquire it in the next year. Data are tabulated on page 126 giving numbers of respondents as well as percentages, not only for the total sample but also by discipline. Demographic breakdowns also are presented on page 126, together with demographic averages for present use and plans to acquire within one year.

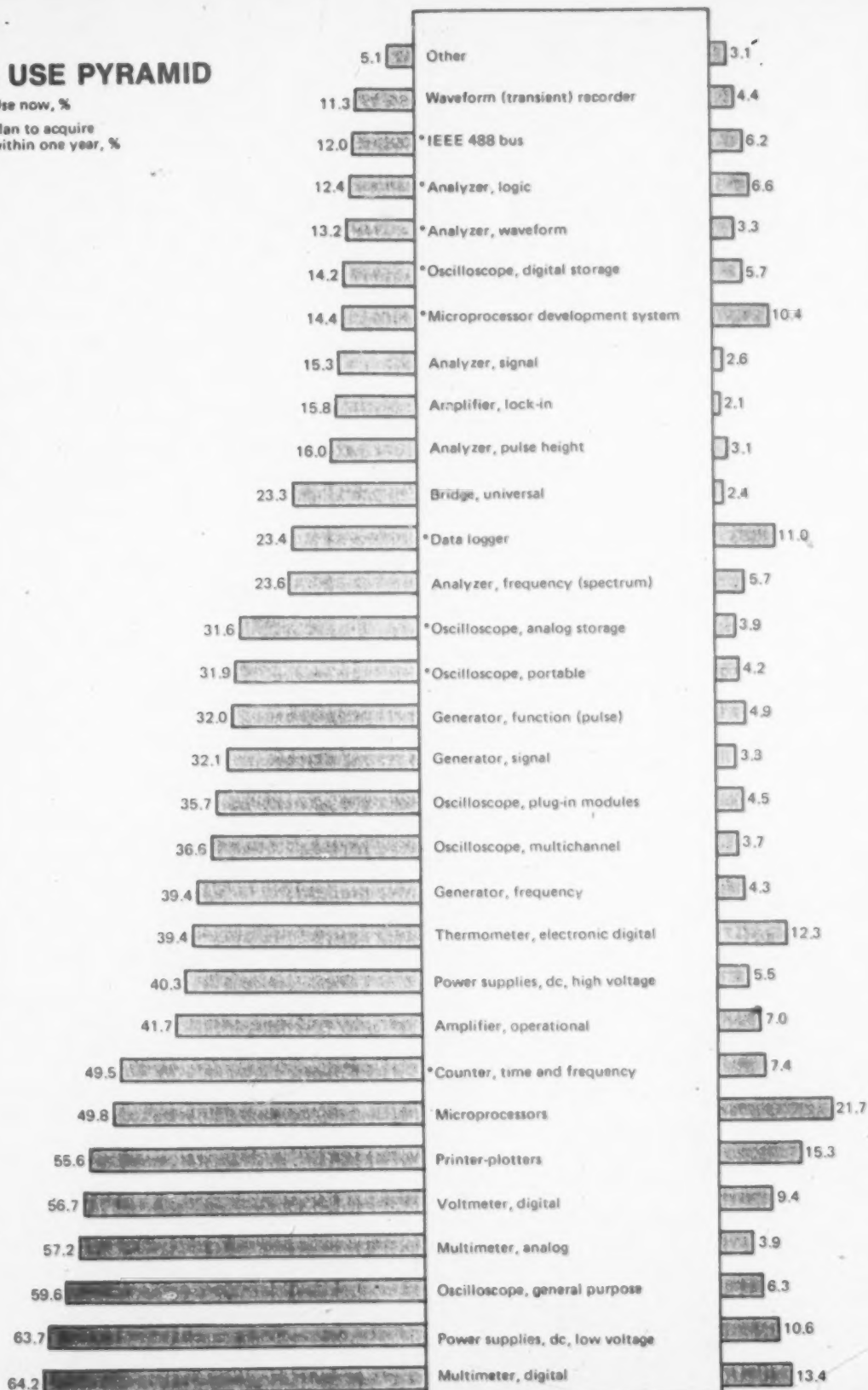
Comparison with results of last year's Trends survey are difficult because of the change in categories. An average of present use for all categories except the "Other" category drops from 36.2% last year to 33.7% this year. But when the added and dropped categories are removed, the corresponding present use numbers are 27.7% for last year, 27.0% this year—well within the statistical accuracy expected with 1,530 respondents in 1979 and 1,447 this year.

Data for plans to acquire also are affected by the change in categories. Without considering the category changes, average plans to acquire were 8.1% of the total sample in 1979 and 6.8% this year. When the changed categories are eliminated from consideration, the change is from 9.5% to 7.0% this year. While this could be attributed to the present economic climate affecting future plans, we believe that a more significant factor is the change in sample composition from one year to another. For example, note that of corporate officers responding to the survey, 10.7% plan to acquire on average, while for professional

THE USE PYRAMID

Left: Use now, %

Right: Plan to acquire within one year, %

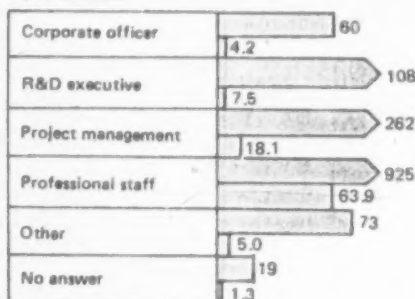


*New category, not included in 1979

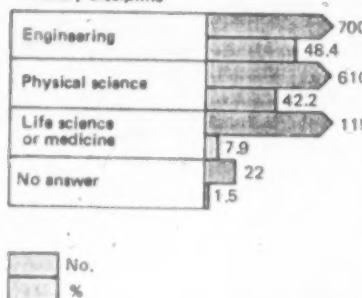
PRESENT AND PLANNED USE

	Use now		Plan to acquire		Growth rate	
	Total sample, 1447	Engineering, 700	Physical science, 610	Life science or medicine, 115	Not classified, 22	
	No. %	No. %	No. %	No. %	No. %	
Amplifier, lock-in	229 15.8	93 13.3	125 20.5	10 8.7	1 4.6	31 2.1
Amplifier, operational	603 41.7	326 46.6	235 38.5	34 29.6	8 36.4	101 7.0
Analyzer, frequency (spectrum)	342 23.6	220 31.4	102 16.7	14 12.2	6 27.3	83 5.7
Analyzer, logic	180 12.4	138 19.7	36 5.9	5 4.3	1 4.6	95 6.6
Analyzer, pulse height	231 16.0	95 13.6	120 19.7	12 10.4	4 18.2	45 3.1
Analyzer, waveform	191 13.2	137 19.6	46 7.5	7 6.1	1 4.6	48 3.3
Analyzer, signal	221 15.3	149 21.3	60 9.8	10 8.7	2 9.1	38 2.6
Bridge, universal	337 23.3	242 34.6	113 18.5	16 13.9	6 27.3	34 2.4
Counter, time & frequency	716 49.5	430 61.4	231 37.9	41 35.7	14 63.6	107 7.4
Data logger	339 23.4	206 29.4	111 18.2	21 18.3	1 4.6	159 11.0
Generator, frequency	670 39.4	371 53.0	189 27.7	22 19.1	8 36.4	62 4.3
Generator, function (pulse)	463 32.0	292 41.7	147 24.1	19 16.5	5 22.7	71 4.9
Generator, signal	485 32.1	308 44.0	133 21.8	18 15.7	6 27.3	47 3.3
IEEE 488 bus	173 12.0	116 16.6	53 8.7	4 3.5	0	—
Microprocessors	721 49.8	374 53.4	278 45.6	56 48.7	13 59.1	314 21.7
Microprocessor development system	206 14.4	144 20.6	52 8.5	7 6.1	5 22.7	151 10.4
Multimeter, analog	827 57.2	465 66.4	313 51.3	41 36.7	8 36.4	57 3.9
Multimeter, digital	929 64.2	532 76.0	351 57.5	35 30.4	11 50.0	104 7.4
Oscilloscope, analog storage	457 31.6	280 40.0	147 24.1	25 21.7	5 22.7	57 3.9
Oscilloscope, digital storage	205 14.2	145 20.7	50 8.2	9 7.8	1 4.6	82 5.7
Oscilloscope, general purpose	862 59.6	485 69.3	321 52.6	40 34.8	16 72.7	91 6.3
Oscilloscope, multichannel	530 36.6	337 48.1	158 25.9	28 24.4	7 31.8	53 3.7
Oscilloscope, plug-in modules	517 35.7	321 45.9	165 27.0	22 19.1	9 40.9	65 4.5
Oscilloscope, portable	461 31.9	309 44.0	133 21.8	14 12.2	6 27.3	61 4.2
Power supplies, dc, high voltage	583 40.3	281 40.1	253 41.5	43 37.4	6 27.3	79 5.5
Power supplies, dc, low voltage	922 63.7	514 73.4	337 55.2	59 51.3	12 54.6	153 10.6
Printer-plotter	905 62.6	389 55.6	348 57.0	59 51.3	9 40.9	222 15.3
Thermometer, electronic digital	570 39.4	322 46.0	209 34.3	33 28.7	6 27.3	178 12.3
Voltmeter, digital	821 56.7	483 69.0	284 46.6	40 34.8	14 63.6	136 9.4
Waveform (transient) recorder	163 11.3	103 14.7	51 8.4	7 6.1	2 9.1	64 4.4
Other	74 5.1	39 5.6	26 4.3	8 7.0	1 4.6	45 3.1

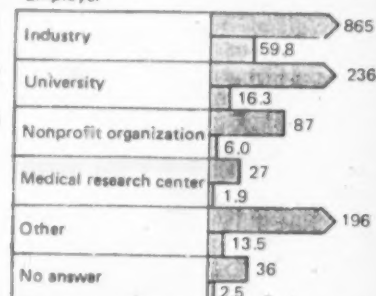
Job function



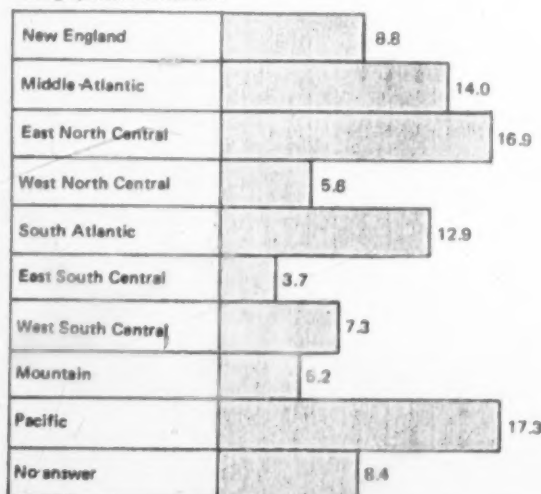
Primary discipline



Employer



Geographical distribution



Averages, in %, of all categories except "other" demographically

Classification	Use now	Plan to acquire
Total sample, 1980	33.7	6.8
Total sample, 1979	36.2	8.1
Total sample, 1980, less 9 new categories	27.0	7.0
Total sample, 1979, less 9 categories dropped	27.7	9.5
By discipline		
Engineering	41.0	8.1
Physical science	28.0	6.0
Life science or medicine	21.8	4.3
No answer	28.9	4.9
By job function		
Corporate officer	25.5	10.7
R&D executive	31.9	9.8
Project management	38.2	8.1
Professional staff	32.6	5.9
Other	39.6	6.9
No answer	34.2	7.7
By sector		
Industry	32.6	6.7
University	38.0	7.3
Nonprofit organization	35.3	6.6
Medical research center	30.0	4.1
Other	33.5	7.2
No answer	37.2	6.7

staff the corresponding number is 5.9%, with executives and managers averaging 9.8% and 8.1%. Apparently, those closest to responsibility for capital expenditures are more confident of the needed funds being available.

But 4.4% of respondents were corporate officers in 1979 versus 4.2% this year, and R&D executives dropped from 8.0% to 7.5%. At the same time, project managers rose from 16.1% to 18.1%, while professional staff increased from 63.3% to 63.9%. Other job function dropped from 5.6% to 5.0%, and the elusive "No answer" more than halved, from 2.7% to 1.3%.

In terms of discipline, representation of engineering rose from 45.0% of respondents in 1979 to 48.4% in 1980, physical science rose from 40.7% to 42.2%, while life science and medicine dropped from 10.4% to 7.9%, and "No answer" from 3.9% to 1.5%. As a benchmark, the domestic circulation of IR&D magazine is 42.6% engineering, 48.3% physical science, and 6.3% life science or medicine. Circulation is much heavier in executive and management ranks than in the Trends survey response, which has been noted in all earlier Trends surveys.

Demographic data on employers of respondents was not included in last year's survey. The IR&D domestic circulation includes 70.3% in industry, 10.0% university, 3.6% nonprofit organization, 1.4% medical research center, 11.2% government, and 3.5% independent consultants. The last two categories are included in the "Other" category in this demographic analysis of the Trends survey, with write-in answers confirming the same split as in the circulation.

Geographic distribution also roughly parallels the IR&D domestic circulation, which includes 7.5% in New England, 22.6% Middle Atlantic, 20.2% East North Central, 5.6% West North Central, 12.7% South Atlantic, 3.6% East South Central, 6.7% West South Central, 4.8% Mountain, and 16.3% Pacific.

As with earlier Trends surveys, this study was conducted by including a prepaid reply postcard in a mailing to United States IR&D subscribers, in late May, 1980. The card listed 30 types of electrical and electronic instruments and equipment. As noted earlier, nine categories were changed from the last such survey. Space was provided for listing other instruments; 74 respondents indicated present use of other instruments, 45 plans to acquire. No single type of instrument filled in by respondents gained a sufficient indication of present use or planned acquisition to displace any listed category.

By June 25, when computer and editorial schedules required a cut-off of returns, 1,523 cards had been returned and were processed. A total of 76 cards were rejected because of multiple answers to demographic questions, which the computer was programmed to reject. Thus 1,447 respondents are represented in the results.

GROWTH RATE

